ing out three tons of this intermediate product daily. A remarkable and novel development has arisen in this branch of the colour industry. The firms engaged in dyeing aniline black are setting up small aniline plants costing 300*l*. to 400*l*. each, capable, under the supervision of one operative, of producing daily 100 lb. of aniline from benzene.

At present the seven companies engaged on finished coal-tar dyes are restricting drastically the number of colours produced, and are concentrating on increased output. Two works are specialising in an ample supply of chlorodinitrobenzene, from which two other well-equipped factories are manufacturing sulphide black on a huge scale. Synthetic indigo is receiving the attention of four powerful chemical companies.

Although the existing equipment for natural dyes installed in six large American works has proved to be a national asset of great value, yet the total supply of dyes is still far short of customary requirements, and the American public is urged to meet the abnormal situation in a spirit of generous compromise. The existing shortage will soon disappear, inasmuch as the United States possess all the enterprise, inventive talent, and technical ability requisite for the development of an American dye industry. As regards the practical experience of industrial colour syntheses, it is suggested that the services of a corps of expert Swiss colour chemists would be of untold value in accelerating the evolution of the new industry. This scheme has already been adopted successfully in Russia, where a group of dye consumers have formed a company, including as a constituent member a leading Basle firm, which supplies a technical staff to the enterprise.

One reason for the former dominance of German colour chemistry was the unity and solidarity of the various firms engaged in this industry, so that when one was menaced by any foreign competitor they all acted in unison. In America the field has been entered by many separated interests imperfectly acquainted with the complexity of the colour problem. A plea for a higher degree of unity is put forward in order to avoid overlapping and duplication of effort. It has been proposed to establish Government factories for the production of coal-tar intermediates, these factories to be available for manufacturing explosives in case of war. A national bureau of standards for dyestuffs would afford considerable protection to the growing industry, and a similar result would be attained by organising the consumers of dyes.

In view of these developments, it appears certain that in a few years America will be practically self-contained as regards dyes. It is not at all probable that the vast industrial organisations by this time established will content themselves with catering only for the American market, especially as the United States possess sufficient of the needed raw materials to supply the whole world's dye industry. British dye producers must expect to face, not only furtive attempts to recover trade by German competitors, but also a direct frontal attack on their home, colonial, and foreign markets by dye-wares of American origin. The only way of meeting this invasion will be by a combination, first of British manufacturers among themselves, and secondly a co-operative union of the British group with similar groups representing the other nations of the Quadruple Entente. The pooling of our resources for war will need to be followed by a partnership in original ideas, technical organisation, and natural resources in regard to the chemical industries of the allied nations.

G. T. M.

OPTICAL INVESTIGATION OF ETHER-DRIFT.

OF all the attempts made to detect a possible influence of the motion of the medium on optical phenomena, the only one giving a positive result, was the celebrated experiment of Fizeau, in which interference was produced between two beams of light which passed along tubes containing running water, the one beam going with the current and the other beam against it. When the direction of the current was reversed the bands were displaced, and the displacement could be explained on the assumption that the ether in the tubes drifted with the current with a velocity $v(1-1/\mu^2)$, where v is the velocity of the water. Fizeau obtained a 14 per cent. agreement between theory and experiment, which was regarded as satisfactory in view of the difficulty of the subject. The experiment was afterwards repeated by Michelson and Morley with more refined means, and they obtained a difference of less than 1 per cent. with a calculated probable error of about 5 per cent.

In 1895, however, in his "Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern," Lorentz gave a new expression for the velocity of the ether drift, namely:—

$$v\left(1-\frac{1}{\mu^2}-\frac{\lambda}{\mu}\frac{d\mu}{d\lambda}\right).$$

This expression is also obtained on the theory of relativity. In the case of water it is quite 3 per cent. larger than Fresnel's value. We have just received two papers reprinted from the Proceedings of the Amsterdam Academy, which describe an elaborate experimental investigation made by Prof. Zeeman at Amsterdam to decide between the two expressions. (Vol. xvii., pp. 445–451, 1914, and vol. xviii., pp. 398–408, 1915.)

The interference fringes were produced by Michelson's method. The length of the tubes was 6 metres and the maximum velocity of the water 5·5 metres per second. As the expression to be tested varies only slightly with the wave-length, the light of an arc lamp could be used as source after it passed through a monochromator. The fringes were recorded photographically; the cross-wires in the focal plane of the telescope came out on the negative, and the displacement of the fringes relative to the cross-wires was

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measured. The exposures were from three to five minutes. Photographs are given in the second paper showing the displacement of the fringes for three different points in the spectrum. The results are summarised in the following table:—

Wave-length	Fresnel coefficient	Lorentz coefficient	Experimental value
4500	0·443	0·464	0·465
4580	0·442	0·463	0·463
5461	0·439	0·454	0·451
6870	0·435	0·447	0·445

The calculated probable error of the experimental result is about 1 per cent. of the latter.

The experiment decides conclusively in favour of the Lorentz coefficient. Not only does the absolute value of the result agree better with the latter, but so also does its variation with the wave-length, the figure for the experimental value being 1616 and the figures derived respectively from the Fresnel and Lorentz coefficients being 1572 and 1608. Thus the degree of accuracy has been pushed a stage further in what was regarded as one of our most accurate experiments.

SCIENCE AND WAR.

WE are permitted to publish this week some passages from Sir William Osler's address to the Leeds Medical School on "Science and War" (Oxford: At the Clarendon Press. Price 1*s*. 6*d*. net). Sir William writes with authority and with distinction: and all who love good thoughts arrayed in good style ought to buy this address and read it with care. He keeps his head clear, though he has chosen a theme vast beyond imagination. The war transcends our powers of thought; so does science. The war has gone beyond us; so has science. Yet he is able, more than most of us, to measure the working together of the immeasurable forces of science and war: for he has always in his head, and in his heart, the duplicity of science. "I bring to life, I bring to death," says Science. In the war, my Lady Science is busy both ways. She employs artists in death and artists in life; she supplies them—so impartial are abstractions—with asphyxiating gases and with antiseptic dressings; she manufactures with equal mind high explosives and protective vaccines, submarines and motor-ambulances. What a thing it is to be an abstraction, a name for systematised thought; to have no morals, no likes or dislikes; to be nothing but a Latin word for the best way of doing what is to be done.

Sir William Osler, as a true man of science, gives an admirable and well-balanced account of this dual influence of scientific method on the war. He is not only a man of science: he is also a great physician, a notable artist in life. His account of one of the chief base hospitals in France is delightful reading; the speed and precision and modernity of the work achieved are above praise. A strong committee has already taken in hand the compiling of the medical and surgical history of the war. It will be a mighty book. The medical and surgical history of the American Civil War is in five huge volumes; we can scarcely have less than that for the present war.

Toward the end of the address, Sir William says what a good many of our great doctors are saying or thinking. "To one who is by temperament and education a Brunonian and free from the 'common antipathies' and 'national repugnances,' one sad sequel of the war will be, for this generation at least, the death of international science." He thinks that science will suffer grievously by some sort of boycott against Germany; he dreads what he calls "Chauvinism in science." He says that "an impassable intellectual gulf yawns between the Allies and Germany." We think that he makes too much of this fear. The gulf between the Allies and Germany is ethical, not intellectual. There will be friendships broken, and international medical congresses made impossible, and no more honorary degrees from German universities, and no hospitality for hospital workers, and so forth; but these losses will be easily tolerable. Science has her own ways of getting back a bit of her own.

The following extracts from Sir William Osler's address may serve to illustrate its wisdom and style:—

> In Time our civilisation is but a thin fringe like the layer of living polyps on the coral reef, capping the dead generations on which it rests. The lust of war is still in the blood: we cannot help it. There was, and there is as yet, no final appeal but to the ordeal of battle. Only let us get the race in its true perspective in which a thousand years are but as yesterday, and in which we are contemporaries of the Babylonians and Egyptians and all together within Plato's year. Let us remember, too, that war is a human development, unknown to other animals. Though nature is ruthless "in tooth and claw," collective war between members of the same species is not one of her weapons; and in this sense Hobbes's dictum that "war was a state of nature" is not true. The dinosaurs and pterodactyls and the mastodons did not perish in a struggle for existence against members of their own species, but were losers in a battle against conditions of nature which others found possible to overcome. In our own day the gradual disappearance of native populations is due as much to whisky and disease as to powder and shot, as witness in illustration of the one the North American Indian and of the other the Tasmanians.
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> Some of us had indulged the fond hope that in the power man had gained over nature had arisen possibilities for intellectual and social development such as to control collectively his morals and emotions, so that the nations would not learn war any more. We were foolish enough to think that where Christianity had failed science might succeed, forgetting that the hopelessness of the failure of the Gospel lay not in the message, but in its interpretation. The promised peace was for the individual—the world was to have tribulations; and Christ expressly said: "Think not that I am come to send peace on earth; I came not to send peace but a sword." The Abou ben Adhems woke daily from their dreams of peace, and lectured and published pamphlets and held congresses, while Krupp built 17-inch howitzers and the gun range of the super-Dreadnoughts increased to eighteen miles!
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> And we had become so polite and civil, so cultured in both senses of that horrid word, with an "Is thy

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